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# Review of implementation on land

## Report of the Secretary-General

*Summary*

Land- and water-use practices and climatic conditions affect the condition of land resources. Degraded land has negative effects on agricultural productivity and rural development. To reverse land degradation, long-term investments across sectors and stakeholders are required. Integrated land management approaches that promote holistic management of all related resources have shown promising results. Certain uses of land can drive climate change (for example, land uses leading to deforestation), others can mitigate it through, for example, carbon sequestration. Despite considerable progress in the development of information systems and tools for land-use planning, their adaptation has been slow.

Secure access to land and other natural resources is an essential part of local empowerment of marginalized individuals and groups and can be instrumental in poverty reduction. Access to land is often seen as a prerequisite to gaining access to other productive resources. Challenges that need to be addressed for sustainable and efficient land management include: providing secure land rights, strengthening capacities of communities, adapting land-use planning technologies, and improving the provisioning of data.

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# I. Introduction

1. The present report reviews progress made in the implementation of Agenda 21,[1] the Programme for the Further Implementation of Agenda 21[2] and the Plan of Implementation of the World Summit on Sustainable Development ("Johannesburg Plan of Implementation"),[3] in the thematic area of land. It takes into account decisions taken at the third, fifth and eighth sessions of the Commission on Sustainable Development on this thematic area. The report draws on inputs provided by Governments, major groups and the United Nations system, in particular the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Environment Programme (UNEP).

# II. Review of progress

2. Chapter 10 of Agenda 21, adopted by the United Nations Conference on Environment and Development, calls for an integrated and sustainable approach to the planning and management of land. The third and eighth sessions of the Commission on Sustainable Development, held in 1995 and 2000, respectively, urged Governments to take a strategic land management approach aimed at creating enabling conditions, particularly for interaction between urban and rural areas, including particularly marginalized groups. Furthermore, it was decided that such an approach should take into consideration the livelihood opportunities of people living in poverty, in particular in rural areas. The Johannesburg Plan of Implementation adopted by the World Summit on Sustainable Development in 2002, reaffirmed these decisions and called for policies and laws that would guarantee well-defined and enforceable land- and water-use rights and promote legal security of tenure. It also called for the promotion of environmentally sound, effective and efficient use of soil fertility improvement practices and for strengthening partnerships and international cooperation towards increasing financial resources for these and related activities.[4]

## A. Changes in the resource base

### 1. Extent and impact of land degradation

3. Land degradation in all its forms poses a serious threat to economic development, food security and rural livelihoods, especially in the poorest regions of the world.[5] It not only diminishes productivity, biodiversity and other ecosystem services, but also has implications for climate change. Available statistics show that

[1] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992*, vol. I, *Resolutions Adopted by the Conference* (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

[2] General Assembly resolution S-19/2, annex.

[3] *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 1, annex.

[4] See Agenda 21, chap. 10; reports of the Commission on its third and eighth sessions, in particular decision 8/3; Johannesburg Plan of Implementation, para. 40.

[5] See World Bank, *Sustainable Land Management: Challenges, Opportunities, and Trade-Offs* (Washington, D.C., World Bank, 2006).

land degradation affects approximately 50 per cent of agricultural lands on moderate slopes and 80 per cent of lands on steep slopes; and 25 per cent of farm households suffer significant soil losses each year.[6] Some of the effects of poor land-use practices result in declining agricultural yields, higher costs to maintain production levels and higher vulnerability to extreme events such as landslides and wildfires. *Global Environment Outlook 4*[7] states that "land degradation in the form of soil erosion, nutrient depletion, water scarcity, salinity and disruption of biological cycles is a fundamental and persistent problem".

4. Attempts to map desertification are often unsatisfactory. A key requirement for mapping desertification is that it be defined in a way that leads to objective and practical measurement criteria. Earth-observing instruments carried on satellites routinely map land surface variables that respond to desertification, such as albedo, surface temperature, and vegetation cover. However, factors such as rainfall that do not relate to desertification also affect these properties.[8] It has been suggested that a persistent reduction of net primary production below its potential that does not disappear during wetter periods could furnish a reliable and practical measurement of desertification.[9]

5. There are signs of land recovery, mainly in the form of regeneration of the natural vegetation. While much of large-scale degradation had occurred prior to 1980, the trends suggest that net overall increase in vegetation started to occur beginning in the early 1980s. This trend was confirmed by some recent studies, mainly based on the analysis of remotely sensed data, which concluded that the world has benefited from higher rainfall and that vegetation cover has increased, particularly, in the Sahel, since the early 1980s.[10]

## 2. Interactions of land and water resources

6. There is a correlation between different land-use types and both the quantity and quality of water resources. Globally, 70 per cent of available freshwater is green water, held in the soil and accessible to plants, whereas only 11 per cent is blue water, accessible as stream flow and groundwater. Better soil and water management can greatly increase land productivity, the resilience of farming systems, and the availability of water resources.

7. Land management techniques that lead to erosion or involve a relatively high input of agrochemicals have a negative influence on the quality of water. Nutrient loading by industries, including agro-industries, leads to toxic algae bloom and human health problems, as well as negative effects on fish populations and aquatic ecosystems, such as coral reefs.

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[6] World Bank, Soil Fertility Initiative, 1997.

[7] United Nations Environment Programme, *Global Environment Outlook* (*GEO*) *4* (2007).

[8] *Millennium Ecosystem Assessment* (Washington, D.C., Island Press, 2005), chap. 22 ("Dryland Systems").

[9] See S. D. Prince, "Spatial and temporal scales of measurement of desertification", *Global Desertification: Do Humans Create Deserts?*, M. Stafford-Smith and J. F. Reynolds, eds. (Berlin, Dahlem University Press, 2002), pp. 23-40.

[10] See S. Herrmann and others, "Recent trends in vegetation dynamics in the African Sahel and their relationship to climate", *Global Environmental Change*, vol. 15 (2005), pp. 394-404; and A. Anyamba and C. J. Tucker, "Analysis of Sahelian vegetation dynamics using NOAA-AVHRR NDVI data from 1981-2003", *Journal of Arid Environments*, vol. 63, No. 3 (2005), pp. 596-614.

**Box I**
**Green Water Credits**

Green Water Credits (GWC) constitute a mechanism for the transfer of cash to rural people in return for land and water management activities that determine the quantity and quality of all freshwater. These activities are currently mainly unrecognized and unrewarded. It is argued that direct payment will enable better management of water and land resources. Better soil and crop management can enhance infiltration, reduce run-off and erosion and reduce evaporation from the soil. A study by the International Soil Reference and Information Centre (ISRIC) found that small cash transfers from downstream water users will enable farmers to adopt sustainable management of land and water while at the same time contributing to rural development by diversifying income. It was further found to be a practical way to assess water resources, optimize their allocation, and calculate cost and benefits. By creating a market between water users and water service providers, an ongoing Green Water Credits project aims to support the current water reform in Kenya, which assigns an economic value to water.

*Source*: International Soil Reference and Information Centre (ISRIC) (http://www.isric.org/UK/About+ISRIC/Projects/Current+Projects/Green+Water+Credits.htm).

8. Lessons learned and achievements have been reported through several international and regional conferences[11] and research by, inter alia, the Consultative Group on International Agricultural Research (CGIAR) Challenge Programme on Water and Food.[12] Green Water Credits, as explained in box I, constitute one mechanism for rewarding integrated land and water management.

9. Integrated water resources management (IWRM) has been identified by countries as a means to improve the interaction in the management of land and water resources. Its implementation, however, is impeded by many challenges including poor land-use practices and lack of institutional capacity. An enabling environment characterized by the necessary environmental, economic, social, cultural, political and institutional conditions is considered vital to improve the integrated management of land and water resources.

### 3. Forest ecosystems

10. The historical decline in temperate forests has been reversed, with an annual increase of 30,000 square kilometres ($km^2$) between 1990 and 2005. Deforestation in the tropics, having begun later, continued at an annual rate of 130,000 $km^2$ over the same period. Exploitation of forests has been undertaken at the expense of biodiversity and natural regulation of water and climate, and has undermined

[11] These include, inter alia, the International Conference on Integrated River Basin Management in Contrasting Climate Zones (University of Hohenheim, Stuttgart, Germany, 2005); East African Integrated River Basin Management Conference (Morogoro, United Republic of Tanzania, March 2005); and a high-level Workshop on Integrated River Basin Management in Latin America (Mexico City, April 1999).

[12] CGIAR Challenge Programme on Water and Food (http://www.waterandfood.org/).

subsistence support and cultural values for some peoples. Concerns over massive deforestation for plantations include the loss of valuable forests that protect fragile soils, loss of habitats for wildlife and, consequently, reduced biodiversity. In addition, emissions from greenhouse gases as well as landslide and flood risk increase. Many countries, however, have demonstrated the political will to improve management of their forests by revising forest policies and legislation and strengthening forestry institutions. Most countries manage forests for multiple uses, and increasing attention is being paid to the conservation of soil, water, biological diversity and environmental services of forests.

11. Innovative management is required to maintain and restore ecosystems. Its effectiveness depends on good governance; however, there is a recognized lack of institutional capacity in many countries to implement, in particular, community-based management schemes. A range of technical responses, legislation and non-binding agreements, such as the non-legally binding instrument on all types of forests,[13] designed to conserve forests and foster ecosystem services, as well as financial mechanisms to support them, have been created. Some countries have developed payment-for-environmental-services schemes as a way to reward forest owners for the production of non-market benefits. As a prerequisite to the success of such schemes, proceeds need to be adequately assessed, collected and invested.

12. From 1990 to 2005, Africa lost more than 9 per cent of its forest area, more than half of this loss having been due to wildfires. Deforestation and uncontrolled forest fires are especially severe in countries suffering from war or other civil conflict. However, forests are obtaining political support and commitment at the highest levels in Africa. For example, the Conference of Ministers in Charge of Forests in Central Africa is an effective forum for regional collaboration in addressing serious environmental issues in relation to forests. While increasing the area of forests to be managed primarily for conservation of biological diversity by 3.5 million hectares to almost 70 million hectares, a majority of countries in the region have also adopted new forest policies and laws, along with increasing their efforts to improve law enforcement and governance.[14]

13. The Latin American and Caribbean region, together with Africa, loses its forests at the highest rates globally. The loss of forests is mainly due to conversion of forests to agricultural land. Countries are making considerable efforts, however, to retain their primary forests. There has been over a 2 per cent increase in the area of forests designated primarily for conservation of biological diversity. Latin American countries have also formed networks to fight forest fires and increase the effectiveness of protected area management. Several countries in the region are among the global leaders in undertaking innovative approaches to forest management, such as payments for environmental services.

## 4. Interrelationship of climate change and land resources

14. There is a clear linkage between land degradation and climate change.[15] Land degradation negatively affects ecosystem services, in particular nutrient cycling, the global carbon cycle and the hydrologic cycle. Land use also has an effect on the

[13] Economic and Social Council resolution 2007/40 of 17 October 2007, annex, appendix.

[14] Food and Agriculture Organization of the United Nations, *State of the World's Forests, 2007* (http://www.fao.org/docrep/009/a0773e/a0773e00.htm).

[15] Global Environment Facility, "Land degradation as a global environmental issue" (2007).

amount of solar radiation reflected from the surface (high reflection in snow-covered areas) and the amount of solar radiation absorbed (high absorption in forest plantations). Deforestation leads to a higher proportion of sunlight reflected. Large-scale changes in reflection of the land surface due to land uses, such as deforestation, contribute to climate change.[16]

15. Sustainable land management depends upon the efficient functioning of related ecosystems. For example, carbon pools in soil and surface vegetation, particularly forests, are very large but easily disturbed. They are affected by unsustainable land management practices and by the type of land degradation that is prevalent (be it, for example, water erosion, deforestation or soil compaction). Estimates of historical contributions of agriculture to atmospheric greenhouse gases, the amounts and rates of carbon lost as a consequence of deforestation and conversion of land to agriculture and other soil-vegetation-atmosphere carbon fluxes, such as those involving decay of peat and peat fires, all suggest that various forms of land use have had a very significant impact on climate, through raising greenhouse gas concentrations. The Intergovernmental Panel on Climate Change (IPCC) estimates in its Fourth Assessment Report that the greenhouse gas emissions through land use, land-use change, and forestry have grown between 1970 and 2004 by 40 per cent.

16. The Fourth Assessment Report further states that the resilience of many ecosystems is likely to be overtaxed during this century by an unprecedented combination of climate change, associated disturbances (for example, flooding, drought, wildfire, insects and ocean acidification) and other drivers of global change (for example, land-use change pollution, overexploitation of resources, etc.). In addition, heavy precipitation events, likely to increase in frequency, trigger soil erosion and waterlogging of soils. In addition, the Panel estimates that by the end of this century, sea-level rise induced by climate change will lead to increased salinization of irrigation water. Land and land-use systems in some regions will be more affected than land and land-use systems in other regions, with water stress and reduced crop production in sub-Saharan Africa; coastal erosion and inundation of small islands; and flooding from the sea and the rivers of the Asian mega-deltas.

17. Climate change is also likely to have severe effects on the agricultural sector, particularly in the developing world, for example, by negatively impacting water quantity and quality in many water-scarce regions. In addition, conditions conducive to wildfires increase in the absence of rain and with the increase of temperatures. Population growth is one factor contributing to the expansion of settlements into areas naturally susceptible to wildfires. This has resulted in an increase of both wildfire frequency and the size of the affected area in many parts of the world.[17] Some regions are considering forming networks of rapid-response teams to effectively respond to the increase in wildfires.

18. Traditionally, disaster relief rather than disaster prevention receives the main share in resources. Often, the mobilization takes time; the funds are insufficient and earmarked according to donors' priorities. Recently, projects for managing risks focusing on reducing vulnerability and establishing adequate coping mechanisms, such as risk insurance, are gaining momentum.

[16] Intergovernmental Panel on Climate Change (IPCC), Fourth Assessment Report (2007).

[17] Global Fire Monitoring Center (http://www.fire.uni-freiburg.de/).

19. Terrestrial ecosystems, which have been classified by IPCC as highly vulnerable to climate change, include tundra, boreal forests, mountains and coastal regions. The Panel estimates that 20-30 per cent of plant and animal species are at risk of extinction. Sea-level rise and human development are together contributing to losses of coastal wetlands and mangroves and increasing damage from coastal flooding in many areas. In other parts of the world, snow cover is projected to contract. Widespread increases in thaw depth are projected over most permafrost regions.

20. The spatial heterogeneity of climate change impacts on cereal production and its consequences for food security was explored by the International Institute for Applied Systems Analysis in 2002.[18] Recent work on the topic of global warming concludes that agriculture in some parts of the world, such as Northern and Eastern Europe would benefit from initial warming, but developing countries and especially the countries of Africa will likely be severely impacted.[19]

21. Mechanisms to expand markets for emission reductions in agriculture, forestry, and other land uses present an opportunity to benefit from sustainable land management approaches. The Clean Development Mechanism and Joint Implementation under the Kyoto Protocol[20] to the United Nations Framework Convention on Climate Change[21] present opportunities to finance reforestation and afforestation. New initiatives, such as the BioCarbon Fund of the World Bank, aim to deliver cost-effective emission reductions, while promoting biodiversity conservation and poverty alleviation.

## B. Integrated land-use planning and management

22. Demands on land resources and the risks to sustainability are likely to intensify. Population growth, economic development and urbanization are driving demands for food, water, energy and raw materials; the continued shift in human diet from cereal to animal products, requiring a higher input in land and water resources, and the recent move towards biofuels add to the demand for farm production, all of this with implications for land uses. Already 700 million people in 43 countries live below the water-stress threshold of 1,700 cubic metres per person per year.[22]

23. Preventing land degradation is usually more effective and cost-efficient than rehabilitating degraded lands. Rehabilitating land already degraded involves facilitating the recovery of the soil's physical integrity, improving the nutrient status and increasing the amount of organic carbon in the soil.

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[18] Gunther Fischer, Mahendra Shah and Harrij van Velthuizen, "Climate change and agricultural vulnerability" (International Institute for Applied Systems Analysis, 2002) (http://www.iiasa.ac.at/Research/LUC/JB-Report.pdf).

[19] Robert Mendelsohn and Larry Williams, "Comparing forecasts of the global impacts of climate change", *Mitigation and Adaptation Strategies for Global Change*, vol. 9, No. 4 (October 2004), pp. 315-333; and William R. Cline, *Global Warming and Agriculture: Impact Estimates by Country* (Washington, D.C., Peterson Institute for International Economics, July 2007).

[20] FCCC/CP/1997/7/Add.1, decision 1/CP.3, annex.

[21] United Nations, *Treaty Series*, vol. 1771, No. 30822.

[22] United Nations Development Programme, *Human Development Report: Beyond Scarcity: Power, poverty and the global water crisis* (Basingstoke, United Kingdom, Palgraw Macmillian, 2006).

### 1. Land planning

24. Modernizing land planning and administrative systems has not always resulted in greater transparency, and many developing countries still lack access to modern technology as a tool for improved land-use planning, especially at the local level. Growth in urban centres is often not equitable, as low-cost housing developments frequently lose out to more lucrative alternatives, serving the middle- and higher-income classes. The poor are forced to settle on marginal lands. The scarcity of land, particularly in Latin America and the Caribbean, has considerably increased land prices in large cities.

25. Slums, whether peri-urban squatter areas, shanty towns or rundown inner-city neighbourhoods, are characterized by substandard housing, overcrowding and absence of clear tenure arrangements. These informal settlements also lack basic services such as safe water, improved sanitation and electricity. Often they are prone to environmental hazards. Today, there are about 1 billion slum-dwellers in the world. The vast majority of these, more than 930 million, are living in developing countries, where they constitute 42 per cent of the urban population. In the urban areas of the least developed countries, slum-dwellers account for 78 per cent of the population. The proportion of slum-dwellers is particularly high in sub-Saharan Africa (72 per cent of the urban population) and in Southern Asia (59 per cent).[23]

26. Every year 19.5 million hectares of agricultural land is converted to spreading urban centres and industrial developments, often forcing farmers onto shrinking and more marginal lands. The uncontrolled expansion of human settlements constitutes a challenge for sustainable land planning and management. Particularly the concentration of people and cities in coastal areas increases the demand for limited land resources. Coastal areas are among the most crowded regions in the world.[24]

### 2. Approaches to sustainable land management

27. During the last 20 years, the exponential expansion of cropland has slackened; land resources are now used more intensively. In the last 25 years, the average production per hectare of cropland increased by almost 40 per cent.[25]

28. Biological nutrient cycling has benefits for land resources and land users. Practices include integrating legumes into the cropping system, improving fallows and applying agroforestry. Widespread adoption, however, is yet to be achieved, and for severely nutrient-deficient soils, there is no remedy except external nutrient inputs.

29. A growing number of communities have shown that it is possible, through improved land management, to increase productivity while having a positive environmental impact. For example, 1.8 million farmers in sub-Saharan Africa on average raised crop yields by 250 per cent on 1.9 million hectares of land and improved their environment through locally appropriate sustainable land management practices. Similarly for rangeland and woodland management, there are

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[23] United Nations Human Settlements Programme (UN-Habitat), *Enhancing Urban Safety and Security: Global Report on Human Settlements, 2007* (London, Earthscan, 2007).

[24] United Nations Environment Programme, Global Programme of Action for the Protection of the Marine Environment from Land-based Activites: Physical Alteration and Destruction of Habitats programme (http://gpa.unep.org/content.html?ln=6&id=199; http://padh.gpa.unep.org/).

[25] United Nations Environment Programme, *Global Environment Outlook (GEO) 4* (2007).

documented good practices that are adapted to local conditions.[26] Agroforestry in north-east Thailand, for example, increased food security, fuelwood security and soil fertility.

30. Conservation agriculture is an approach combining practices of minimal soil disturbance, permanent soil cover and crop rotations to achieve sustainable and profitable agriculture for improving the livelihoods of farmers. It aims at enhancing natural soil regeneration processes involving improved management of organic matter in the soil as well as efficient use of rainfall, soil moisture and plant nutrients; and the maintenance of physical properties of the soil by keeping mechanical tillage for direct planting and seeding to the absolute minimum.

31. Progress is being made in introducing and adapting conservation agriculture systems that were developed and adopted over the last two decades by farmers, ranging from small- to large-scale ones in Latin America, Northern America, Australasia and Central Asia, and smallholders as well as commercial farmers in Africa, South and South-East Asia and the Near East. Although this approach has not yet been widely adopted in sub-Saharan Africa, the area under conservation agriculture is expanding in Kenya, Madagascar, South Africa, Uganda, the United Republic of Tanzania and Zambia. Conservation agriculture systems have also been successfully piloted in West Africa (for example, by Burkina Faso, Mali and the Niger) and in Central Asia (for example, by Kazakhstan and Pakistan). Costs involved for transforming conventionally managed agricultural land, however, is an impediment to the wider adoption of conservation agriculture. Some farmers are also resistant to change farming practices.

32. Conservation agriculture systems have proved to be effective in improving and maintaining land productivity and resilience in respect of drought, run-off and erosion in a range of scales and ecological zones. Other benefits include significant savings in labour and energy for tillage and weeding. Additional advantages include risk reduction due to reliable yields, food security, cost savings and improved coping capacity of the agricultural system with respect to climate variability and change because of enhanced soil and crop health and moisture conservation.

33. The African Centre for Fertilizer Development has developed an integrated farming system designed to achieve multiple goals: improvement in crop yields, improvement in the diet of farmers, increase of cash incomes for farmers, soil and water conservation, increase of soil fertility, and labour-saving (because of reduced labour availability in the region). This farming system combines proper and timely input use (organic and mineral fertilizers, liming, seed and agrochemicals); conservation tillage; and diversified intercropping systems and agroforestry. It has been able to return more than 100 per cent per year on working capital and considerable savings on labour for weeding.

34. The International Fertilizer Development Centre has developed an integrated soil fertility management package of sustainable inputs and practices raising agricultural productivity that is promoted through a participatory approach. The combined use of soil amendments, organic materials and mineral fertilizers replenishes plant nutrients in the soil and improves cost-effectiveness of external inputs. The yields are 2 to 3 times higher than national yields. The return on capital

[26] Andrew Noble and others, "Development of 'bright spots' in Africa: cause for optimism" (2005) (http://www.iwmi.cgiar.org/brightspots/).

invested exceeds 100 per cent, and returns to family labour are 2 to 6 times higher than the average salary in sub-Saharan Africa. The project operates in Benin, Burkina Faso, Ghana, Mali, the Niger, Nigeria and Togo, with more than 2,000 farmers in 100 villages selecting, trying out and adapting the methods in their own fields. A prerequisite for increasing the use of fertilizers is to develop capacity for their use that is responsible and effective so as to avoid the pollution of aquifers and damage to ecosystems, while at the same time achieving as much cost-effectiveness as possible.

35. Watershed management is critical to the sustainability of land and water resources. Set-asides, reforestation and soil conservation on a large scale are essential in upland areas. In floodplains, land zoning to provide space for inevitable flooding is preferable to costly and, eventually, often unsuccessful efforts to control floods.[27] Forests decrease run-off more effectively than crop- and grasslands, thus decreasing the susceptibility of the land to erosion.[28]

36. Municipalities in several countries, including Brazil, Costa Rica, Ecuador, Mexico and the United States of America, have been investing in watershed management to safeguard or improve the reliability and quality of their drinking-water supplies. In New York City, for example, paying landowners to change land-use practices proved to be a cost-effective way to meet the municipal objective of improving the quality of water resources, and also contributed to conservation of the land resources in the watersheds. In Brazil, in the State of São Paulo, an inter-municipal consortium, jointly with local and international partners, has been addressing a similar issue.

37. Since 2000, the Lao People's Democratic Republic has been implementing a programme aimed at: (a) improving the conservation and management of natural resources within a watershed to enhance their economic use; and (b) alleviating poverty and improving sustainable livelihood opportunities. The programme seems to be helping the country in reversing unsustainable resource management practices and addressing poverty reduction through sustainable livelihoods.[29]

38. The Declaration of Atitlán, Guatemala (2002), outcome of the Indigenous Peoples' Global Consultation on the Right to Food, held in Atitlán, Sololá, Guatemala, from 17 to 19 April 2002, emphasized the importance of indigenous knowledge and practices for sustainable agriculture and food systems and also calls for improving the dissemination of indigenous knowledge on the impacts of agrochemicals and genetic engineering. In this regard, the Food and Agriculture Organization of the United Nations (FAO) and indigenous peoples' organizations undertook the preparation of a paper exploring the scientific basis for some traditional indicators used by indigenous people to guide decision-making related to

[27] David Grey and Claudia Sadoff, "Water resources and poverty in Africa: essential economic and political responses", paper presented at the African Ministerial Conference on Water, Abuja, 2002.

[28] I. R. Calder, *The Blue Revolution: Land Use and Integrated Water Resource Management* (London, Earthscan, 2005).

[29] P. Pravongviengkham and others, "Integrated watershed management for sustainable upland development and poverty alleviation in Lao People's Democratic Republic" (proceedings of the Asian Workshop, Kathmandu, 11-13 September 2003) Watershed Management and Sustainable Mountain Development Working Paper, No. 5 (Rome, Food and Agriculture Organization of the United Nations, 2005).

agricultural practices. This initiative aimed to support indigenous peoples' capacity and underline the legitimacy of indigenous land management approaches.[30] The United Nations Declaration on the Rights of Indigenous Peoples, adopted by the General Assembly on 13 September 2007 (Assembly resolution 61/295, annex) confirms the right of indigenous peoples to self-determination and recognizes subsistence rights and rights to lands, territories and resources.

39. Farmer field schools are increasingly recognized as an effective means for building capacity of farmers and service providers (facilitation, extension and research). Many provide training in participatory diagnosis and constraints analysis; farmer empowerment; and farmer experimentation, innovation and adaptation to local contexts. Substantial progress has been made, for example, in Kenya and Sierra Leone, in adapting farm field schools for many subject areas: crop, livestock, soil and water management; marketing; life support-coping with HIV/AIDS; nutrition; and post-emergency interventions.

### 3. Financing mechanisms for integrated land management

40. Along with project and programme funding by national Governments (see box II), international agencies and development banks, an increasing range of financing mechanisms have stimulated integrated land resources management in the last decade. These have facilitated payments for ecosystem services such as water supply and quality (box I) and payments for carbon sequestration — regulated under international agreements such as the Clean Development Mechanism, as well as in the form of voluntary contributions through non-governmental initiatives. The Clean Development Mechanism allows payments for land-use change such as afforestation, but not for increasing soil carbon contents through conversion from conventional plough-based agriculture to land management methods such as conservation agriculture.

41. Changes oriented towards better integrated land management result in improvements of the ecosystem and offer land users economic incentives. For example, Rainforest Alliance[31] certification of coffee, cacao, fruits and flowers requires ecosystem management and protection of wildlife and waterways but also opens a profitable niche market. Another example is the South Africa Biodiversity and Wine Initiative, which has created a viable marketing opportunity, highlighting sustainable natural resource management and efforts to conserve the natural heritage of South Africa. In the last decade, the Initiative has helped to ensure the participation of winegrowers with more than 40,000 hectares, representing 40 per cent of the total vineyards in Cape Province. It resulted in setting aside natural habitat in contractually protected areas and also entailed a change in farming practices to enhance the suitability of vineyards as a habitat, stimulating biodiversity, and reduce negative impacts in and outside vineyards.

[30] Food and Agriculture Organization of the United Nations Sustainable Agriculture and Rural Development (SARD) Initiative: SARD and Indigenous Culture (http://www.fao.org/sard/en/init/964/2687/2453/index.html).

[31] Rainforest Alliance (http://www.rainforest-alliance.org/certification/).

**Box II**
**China's "Grain for Green" programme**

A series of devastating floods in 1998, led China, in 1999, to start the "Grain for Green" programme. One of the largest conservation set-aside programmes in the world, its main objective is to increase forest cover on sloped cropland in the upper reaches of the Yangtze and Yellow River Basins to prevent soil erosion. When the programme is available in their community, households set aside all or parts of certain types of land and plant seedlings to grow trees. In return, the Government compensates the participants with in-kind grain, cash payments and free seedlings.

By the end of 2002, officials had expanded the programme to some 15 million farmers in more than 2,000 counties in 25 provinces and municipalities in China. If the programme meets its original goals, by 2010 nearly 15 million hectares of cropland will have been set aside, affecting the land of more than 50 million households.

*Source*: Emi Uchida, Jintao Xu and Scott Rozelle, "Grain for Green: cost-effectiveness and sustainability of China's conservation set-aside program", *Land Economics*, vol. 81, No. 2 (2005), pp. 247-264.

42. The export of high-value, high-quality produce can also provide the resources to improve land management as well as land and environmental quality. In the highlands of Madagascar, for example, almost 10,000 small farmers are producing hand-picked fine French beans and other vegetables for European supermarkets, where they fetch up to three times the price paid for industrially produced French beans. A variety of standards have been created, including ethical employment practices (for example, no child labour). To satisfy these standards, the exporting company has combined its microcontracts with farmers with extensive farm supervision and assistance. This includes teaching the farmers how to make compost as a means for maintaining soil structure and improving water-holding capacity.

43. The success of collaborative management depends on financing mechanisms that are long term, flexible and based on cost-sharing and offer incentives to support private initiatives in watershed conservation.[32] Some countries have already established environmental or forest trust funds (box III) to finance watershed management activities.

44. Through the Financial Information Engine on Land Degradation (FIELD), the Global Mechanism of the United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa,[33] is aiming to progressively build up and maintain comprehensive inventories of financial resources, needs and flows in order to combat desertification to the benefit of all stakeholders. The aim is to collect and disseminate information

[32] Food and Agriculture Organization of the United Nations, Forestry Department, *The new Generation of Watershed Management Programmes and Projects*, FAO Forestry Paper 150 (Rome, Food and Agriculture Organization of the United Nations, 2006) (http://www.fao.org/docrep/009/a0644e/a0644e00.htm).

[33] United Nations, *Treaty Series*, vol. 1954, No. 33480.

not only to ensure a rational use of existing resources for the implementation of the Convention, but also to identify gaps in resource flows, and to facilitate implementation of the action programmes.

Box III
**Environmental trust funds and watershed management in Bhutan and Viet Nam**

The Bhutan environmental trust fund was set up to finance nature conservation and biodiversity projects. Donors contribute to the Government's core fund for implementing environment-related activities under its national programme. Interest from the fund is spent on projects, while the capital is locked to generate funding for future projects.

The Viet Nam trust fund for forests was set up in 1999 under the Ministry of Agriculture and Rural Development. It is supported by international donors for the implementation of the Forest Sector Support Programme and other Government programmes for the forest sector, including the 5 million hectares reforestation project. The objectives include: (a) aligning donor support more closely to the priorities identified in the Support Programme framework; (b) targeting poverty alleviation with respect to donor support to the forest sector; (c) harmonizing aid to the forest sector and reducing transaction costs; and (d) supporting the transition towards a sector-wide approach.

*Source*: Watershed Management and Sustainable Mountain Development Working Paper, No. 5 (Rome, Food and Agriculture Organization of the United Nations, 2005).

45. The TerrAfrica partnership programme and its Strategic Investment Programme for Sustainable Land Management in Sub-Saharan Africa are designed to help unlock the potential for progress through sustainable land management.[34] TerrAfrica is based on the premise that sustainable land management mainstreaming and upscaling is key to ecosystem stability and development in sub-Saharan Africa. It provides partners in sub-Saharan Africa with an operational framework for mainstreaming and upscaling cost-effective and efficient sustainable land management through three strategic approaches: regional partnership; knowledge generation and dissemination; and investment development and alignment. TerrAfrica provides partners with a common platform for supporting African leadership and better targeting and aligning investment at multiple levels.

## 4. Impact of crop prices on land resources

46. Crop prices influence the relative profitability of land management options and thus land allocation decisions for alternative production scenarios. If markets are inefficient and prices are distorted, land and other natural resource endowments may be significantly undervalued. This may lead to over-consumption and resource degradation. For example, low stumpage fees, that is to say, the prices charged by a

[34] TerrAfrica (http://www.terrafrica.org/).

landowner to companies or operators for the right to harvest timber on his or her land, coupled with low prices for fertilizers and pesticides along with the absence of environmental service markets and effective regulation, is likely to result in land degradation.

47. Accordingly, changes in policies responding to market forces can lead to drastic change in established land-use systems. For example, a factor in the increase in grain prices in 2007 has been the rapidly expanding demand for ethanol as biofuel. The promotion of ethanol, particularly in the United States of America, led to the conversion of land for maize production, where wheat and soy had been previously grown.

48. The global demand for biofuels also fuelled the expansion of agricultural production and the clearing of forests and savannah lands in Latin America and Asia. The decrease in wheat and soy production fuelled prices for these crops, which led to the expansion of their production in Brazil, whose export of sugar cane, a much more efficient crop for biofuel production in comparison with maize, is limited by tariffs.

49. Another factor for changes in crop prices with implications for land uses is changing consumption patterns. For example, higher income in some countries, most notably China and India, has increased global meat consumption. That now significantly more grain than 20 years ago is consumed for animal production is another factor that has led to an increase in grain prices. The increase in prices for grain makes it more profitable to intensify production and to cultivate on marginal lands, thus increasing the pressure on ecosystems.

## 5. Information systems and tools for land-use planning

50. Information systems on land resources, and land use, as well as relevant socio-economic settings are crucial to ensure informed decision-making for integrated land use. Accessibility of this information is important to ensure participation of all relevant stakeholders affected by changes.

51. Knowledge and information concerning water, terrain, climate, land use and socio-economic factors as well as land cover have increased in recent years, mainly through technological developments. Notably, enhanced imagery from remote sensing satellites has led to a better description of how global land cover is changing.

52. Efforts continue to improve deficient information systems on many aspects of agricultural land use and management at different levels, and to strengthen capacities in this field.[35] As a result, notable progress has been made over the last five years in the compilation and dissemination of data at global to regional scales that are useful for policy formulation.

53. Also, networks and projects with a focus on land cover have been developed in recent years (see box IV, for example).[36] Available data on water availability,

[35] FAO GeoNetwork (http://www.fao.org/geonetwork/srv/en/main.home).

[36] FAO Global Land Cover Network (http://www.glcn.org/news/); FAO Forest Resources Assessment (http://www.fao.org/forestry/site/fra/en/); and FAO/UNEP Land Degradation Assessment in Drylands project (http://lada.virtualcentre.org/pagedisplay/display.asp).

quality and use, mainly related to agriculture, are being compiled;[37] data on land suitability and potential changes in land suitability due to climate change are being explored;[38] and information on soil and terrain are being compiled.[39]

54. Mapping of soils has barely progressed and most countries have been abandoning soil surveys as a routine activity since the late 1980s. One notable exception is the continuing work on soil surveys in the United States. To overcome this knowledge gap, rapid soil visual assessment methods have been developed and adapted to various contexts. Such methods will enable farmers and local service providers to make better management decisions and to assess impacts of various technologies based on their better knowledge of soil constraints and differences. More sophisticated tools are also being developed for soil assessment and soil biodiversity characterization by the World Agroforestry Centre (ICRAF), using infrared and other recent technological developments.

Box IV
**Participatory land-use development in Bosnia and Herzegovina**

In Bosnia and Herzegovina, an ongoing joint project had created an inventory using a geographic information system reflecting the current state of the country's land resources and a land evaluation system based on the FAO Agro-ecological Zoning (AEZ) methodology. In the second phase, a land evaluation system at local level was introduced by developing the concept of economic-ecologic zoning (EEZ).

The participatory land-use development approach was introduced and implemented in 10 pilot municipalities, based on the concepts of negotiated territorial development. These municipalities now have GIS databases and economic-ecologic zoning as planning tools. A series of workshops have been organized to train Government, municipality and non-governmental organization staff in the concepts and the use of the methodology.

The Ministry of Agriculture recently decided to create units for rural land redevelopment in order to follow up and coordinate rural development and land resources management.

*Source*: Inventory of the post-war situation of land resources in Bosnia and Herzegovina (http://www.plud.ba/).

## C. Access to and distribution of land

55. The lack of clearly defined tenure and access rights to land and other natural resources is particularly problematic for poor rural land users, preventing them from undertaking the necessary investments in sustainable natural resource

[37] FAO Aquastat (http://www.fao.org/nr/water/aquastat/main/index.stm).

[38] Agro-ecological Zones (AEZ) methodology (http://www.iiasa.ac.at/Research/LUC/SAEZ/index.html).

[39] FAO Global Soul and Terrain Database (SOTER) (http://www.fao.org/landandwater/lwdms.stm).

management.[40] Where the poor do have rights over resources, they are often held as common property, particularly in many countries in Africa. Various forms of programmes to address the issue of property rights have been undertaken in developing countries, including agrarian reform, community forestry and land titling programmes. Boxes V and VI describe two such examples.

Box V
**Agrarian reform in Brazil**

In Brazil, the process of the redistributing and titling of land and the settlement of smallholders has placed emphasis on the sustainable development of small farmers' enterprises and rural areas. Ongoing efforts to establish essential rural infrastructure and to improve access to credits, technical assistance and training are under way.

The national policy for sustainable rural development facilitated the transfer of technology and production systems from successful family farms to the new land reform beneficiaries. Guidelines were elaborated for sustainable development for small family farming and household agriculture. Moreover, institutional capacity in the design and implementation of gender-responsive policies was strengthened and programmes and projects were implemented that reduced or eliminated legislative, administrative, socio-economic and behavioural obstacles to rural women's access to productive resources in the agrarian reform sector.

*Source*: Instituto nacional de Colonização e Reforma Agrária (http://www.incra.gov.br/).

## 1. Access to productive resources and poverty alleviation

56. In practice, ownership of land or another form of registered long-term land-use rights is often considered a vital instrument for leveraging resources (in terms of, for example, credit at moderate rates, and water usage rights) which may reduce poverty. In Nicaragua, for example, tenure issues were critical for the successful participation of the poor in the payments-for-environmental-services programmes, which required long-term investments such as adoption of silvo-pastoral practices or reforestation. In Costa Rica, participants in a similar programme were initially required to have land titles; now, poorer land users with non-formal forms of tenure can enter the programme as well.

57. Evidence shows that access to land is one crucial factor that creates enabling conditions to empower poor and marginalized groups. Still in some societies, owing

[40] Food and Agriculture Organization of the United Nations, *The State of Food and Agriculture 2005* (Rome, FAO, 2005); Leslie Lipper and Dan Osgood, *Dirt Poor: Poverty, Farmers and Soil Resource Investment: Two Essays on Socio-Economic Aspects of Soil Degradation*, FAO Economic and Social Development Paper, No. 149 (Rome, FAO, 2001) (http://www.fao.org/DOCREP/004/Y1796E/y1796e02.htm#P4_0); Klaus Deininger, "Making negotiated land reform work: initial experience from Colombia, Brazil, and South Africa", *World Development*, vol. 24, No. 4 (1999), pp. 651-672; and Partha Dasgupta, "The economics of the environment", *Environment and Development Economics*, vol. 1 (1996), pp. 387-421.

to customary inheritance systems or the legacy of colonization, women and indigenous groups are not entitled to have access to land. Addressing this challenge can contribute significantly to achieving the overarching goal of poverty reduction.

Box VI
**Land tenure and environmental services: insights from Nepal and the Philippines**

Leasehold forestry in Nepal was designed to achieve the dual goals of poverty reduction and eco-restoration and has been targeted specifically at degraded forest-land areas. Forest leases are awarded to a corporate body, industry or community for a maximum of 40 years, thus being renewable and formalized in a lease certificate. Leaseholds may be granted for the purposes of producing raw materials for forestry industries, selling or distributing forest products from forestation, operating tourism, agroforestry, or maintaining insects, butterflies and wildlife.

Community-based forest management (CBFM) is the cornerstone of the Philippines development strategy, and was adopted formally in 1995 in response to rapid deforestation caused by excessive logging, shifting agriculture and inefficient forest management. The two primary instruments for granting long-term tenure, as adopted by the community-based forest management programme, are the Community-Based Forest Management Agreement and the Certificate of Stewardship Contract.

The tenure programmes of both Nepal and the Philippines resulted in increases in socio-economic and environmental benefits. It should be noted that these programmes were site-specific, depending on the physical and ecological context as well as on proximity to settlements and ease of market access.

*Sources*: Rural Poverty Portal (http://www.ruralpovertyportal.org/english/learn/forestry/leasehold.htm); and Rodel D. Lasco and Juan M. Pulhin, "Environmental impacts of community-based forest management in the Philippines", *International Journal of Environment and Sustainable Development*, vol. 5, No. 1 (2006), pp. 46-56.

58. Providing the poor and landless with more equitable and secure access to land usually requires changes in policies, legislation and institutions. It requires action at the global and national levels as well as in local communities. One major global recent activity has been the International Conference on Agrarian Reform and Rural Development (ICARRD), held in Pôrto Alegre, Brazil, in 2006,[41] which prepared, inter alia, a proposal for a special initiative on agrarian reform and rural development.

[41] International Conference on Agrarian Reform and Rural Development (ICARRD) (http://www.icarrd.org/).

## 2. Land titling and registration

59. In Asia and Latin America, there has been some success with land titling and registration (see, for example, boxes V, VI and VII). In Africa, registration programmes have often proved to be slow, expensive and difficult to keep up to date and hard for poor people to access. As a result, very little rural land has been registered, and formal tenure covers only between 2 and 10 per cent of the land.[42] Land registration — through tools and institutions adapted to local conditions — have, in some instances, proved to be a useful component of a broader tenure security strategy, particularly where customary systems have collapsed, where land disputes are widespread, and in newly settled areas. Registration may also be useful in areas of high-value land, such as urban and peri-urban areas and irrigated lands, where competition is particularly fierce. Simple, low-cost and accessible forms of land records and the registration of community land rights are being introduced on an experimental basis in several countries around the world (as exemplified, for example, by the land records in the Niger and the Ethiopian State of Tigray and the community land rights in Mozambique and the Philippines).

60. As a result of this shift in thinking, recent land policies and laws feature important innovations compared with their predecessors. Several countries have made explicit efforts to capture all land rights in records, as reflected, for instance, in protecting customary land rights and providing for their registration (for example, Mozambique, Namibia, the Niger, Uganda and the United Republic of Tanzania). Use or lease rights over State-owned land may also be registered or are otherwise protected (Ethiopia, Mozambique and Viet Nam). In Mozambique, for example, customary use rights are protected regardless of whether formal registration exists. Several recent titling programmes have issued titles not only to individuals but also to families through joint titling for couples (for example, Nicaragua and Brazil) or to groups or communities (for example, South Africa, Mozambique and the Philippines).

61. It is widely recognized that secure tenure does not necessarily require individual titles or landownership. In Viet Nam and China, for example, security has been achieved with clearly defined and sufficiently long-term use rights over land that is ultimately State property. Community land rights can also provide adequate tenure security, provided that group members enjoy clear rights over their plots. In Mozambique, for example, all land belongs to the State, but communities can register a collective, long-term interest and manage land rights according to customary or other local practices. Many countries have adopted national plans of action and established national frameworks to promote women's empowerment. Most constitutions today prohibit gender discrimination and protect women's rights. Legislative reforms have brought about changes in family and succession law directed towards equality between spouses and full legal capacity of married women, and towards greater gender equality in inheritance rights. Moreover, women's legal status has in many countries been improved by judicial decisions declaring discriminatory norms to be unconstitutional.

62. Clear and secure rights for communities or individuals to control and manage land are widely recognized as an important enabling condition for improving

[42] Klaus Deininger, *Land Policies for Growth and Poverty Reduction* (Washington, D.C., World Bank, 2003).

national and household food security and sustainable development. Addressing the challenge of securing land access and land rights is an important factor in poverty reduction and in the creation of sustainable livelihoods.

Box VII
**The *doi moi* reforms in Viet Nam**

In Viet Nam, the *doi moi* reforms, starting in 1986, allocated cooperative land to farm households, legalized private ownership of productive assets, deregulated agricultural marketing and prices, and devalued the exchange rate. These reforms resulted in better farm-level prices for coffee and stimulated private farmers to expand coffee cultivation. At the same time, many of the State coffee farms began allocating plots to workers, converting them from members of a cooperative to tenants or renters who were responsible for the production of a given parcel of land.

The results of these policy changes resulted, over the period 1986-1996, in an increase of coffee-producing area by almost 21 per cent annually, and an increase in yields per hectare by 6 per cent annually. As a result, coffee production has expanded twelvefold. Coffee exports have come to account for 6-12 per cent of the total value of Vietnamese exports, establishing Viet Nam as the fourth largest coffee exporter.

*Source*: Nicholas Minot, International Food Policy Research Institute, "Competitiveness of food processing in Viet Nam: a study of the rice, coffee, seafood, and fruit and vegetable subsectors" (Washington, D.C., International Food Policy Research Institute, 19 April 1998).

# III. Continuing challenges

63. Land degradation is a global development issue with serious implications for sustainable development. Inaction with respect to conserving land and reversing land degradation results in further land degradation, from which recovery is difficult. Land degradation can be arrested, even reversed, but this requires concerted, long-term investment by all levels of government and by individual land users' supporting more sustainable land management practices. Securing reliable data and adaptation of technologies appropriate to local circumstances are crucial tools for sustainable land management. Effective governance is frequently cited as a crucial factor to improving land planning and management. Building institutional capacity within all levels of Governments remains a challenge.

64. Thus institutional, financial, human and technological capacity present challenges to achieving a more sustainable land management. These challenges hamper the application of existing knowledge, the diversification of land use, in particular of farming systems that mimic natural ecosystems and match local conditions, technological advances, providing payments for ecosystem services, and the promotion of viable initiatives by civil society and the private sector.

65. Conservation agriculture has many positive effects on ecosystem, individuals and society. However, its widespread adoption is mainly constrained by the initial start-up costs and a lack of will to change agricultural systems, particularly in developed countries.

66. Reducing the transaction costs in financing the transition to sustainable land management by simplifying the rules and exploiting economies of scale remains a challenge in the wide-scale adoption of innovative financing mechanisms such as payments for carbon sequestration. Devising methods to effectively monitor and evaluate water service provision of land users, particularly in smallholder agricultural landscapes, remains another challenge.

67. Achieving the ability to enter profitable markets for organically grown food or other niche markets presents significant challenges for producers. These challenges entail the fact that many farms are relatively small in terms of traded volumes and substantial investments are required to develop certification mechanisms and institutions. Securing acceptance for certification in markets, particularly outside the country, presents another challenge.

68. Land tenure issues relating to indigenous peoples are particularly acute in Latin America and in South and South-East Asia. In many areas, indigenous lands are under intense pressure from outside interests — such as incoming agribusiness, timber and mining companies, and large-scale infrastructure projects. In the past decade, however, indigenous groups in many countries have also achieved greater assertiveness and leverage. In several instances, this has led to both political mobilization and legal processes, including litigation before national and international courts. While such lawsuits are not always successful, they do show the extent of civil society mobilization around indigenous lands issues. It remains a challenge to successfully accommodate the interests of new developments while securing the rights of indigenous peoples.

69. Sustainable land management is closely linked to secure land rights, but many Governments are facing difficulties in granting such rights owing to a lack of human capacity and costs involved in land titling. Secure land access not only prevents conflicts, but also empowers local individuals and communities to take actions towards improving land productivity and poverty reduction.